

What is claimed is:

1. A process for recovering a pure soda ash product from impure and relatively depleted sodium carbonate bearing streams comprising:
 - a) combining a plurality of sodium carbonate bearing streams in a proportion to suitably feed a sodium carbonate decahydrate process;
 - b) neutralizing and thereby reducing the bicarbonate concentration of said combined streams by a means selected from treatment with (i) a neutralizing agent, (ii) decarbonizing, (iii) diluting with the addition of a more highly concentrated sodium carbonate bearing stream, and (iv) combination of neutralizing, decarbonizing, and diluting;
 - c) crystallizing sodium salts from said combination of streams to form sodium carbonate decahydrate;
 - d) sufficiently purging and recycling accumulated impurities from steps a through c;
 - e) utilizing the decahydrate from step d to concentrate a less concentrated sodium salt blend;
 - f) crystallizing sodium carbonate product having a desired level of sodium carbonate from the concentrated product of step c;
 - g) wasting purge stream from step d to surface evaporation ponds to avoid the costs and hazards associated with underground disposal methods.
2. The process of Claim 1 wherein the purge steam from step d is utilized to effect a processing step selected from to (i) concentrating a less concentrated sodium carbonate stream, (ii) feeding the sodium decahydrate unit, and (iii) both concentrating a less concentrated sodium carbonate stream and feeding a sodium carbonate decahydrate unit.
3. A process for producing calcium chloride by withdrawing calcium carbonate from the neutralization by-product of step b of Claim 1.
4. A process according to Claim 1 wherein the lesser sodium carbonate bearing waste streams include mine water, pond water, other sodium carbonate bearing streams such as containment basins used to comply with environmental liquid discharge permits, and other process waste streams with concentrations less than about 18% sodium carbonate.
5. A process according to Claim 1 wherein the higher concentrated sodium bearing waste streams include pond water, enriched warm water introduced to impounded sodium decahydrate deposits with the purpose of enriching said warm water in

sodium concentration by melting and dissolving said deposits, streams enriched in sodium carbonate concentration by mechanically mining said impounded sodium decahydrate deposits, sodium carbonate monohydrate purge streams and other sodium carbonate evaporator/crystallizer purge streams with concentrations greater than about 18% sodium carbonate.

6. A process according to claim 1 wherein ~~separate or combined waste streams~~ are enriched in sodium carbonate concentration to crystallize ~~the specific sodium carbonate salt species~~ desired that includes:
 - a) combining streams of lesser sodium carbonate concentration with streams of higher sodium carbonate concentrations;
 - b) enriching streams of lesser sodium carbonate concentration with decahydrate crystals;
 - c) evaporating water from streams of lesser or greater sodium carbonate concentration using such methods as the third effect of a triple effect crystallizer train, cooling towers, evaporator cooler, air cooled spray evaporator/crystallizer, or other evaporation methods known in the art;
 - d) and appropriate combination of the above.
7. A process according to Claim 1 wherein ~~separate or combined waste streams~~ are enriched in sodium carbonate concentration to crystallize ~~the specific sodium carbonate salt species~~ desired that includes:
 - a) combining streams of lesser sodium carbonate concentration with streams of higher sodium carbonate concentrations;
 - b) enriching streams of lesser sodium carbonate concentration with decahydrate crystals;
 - c) evaporating water from streams of lesser or greater sodium carbonate concentration using such methods as the third effect of a triple effect crystallizer train, cooling towers, evaporator cooler, air cooled spray evaporator/crystallizer, or other evaporation methods known in the art;
 - d) and appropriate combination of the above.
8. A process according to claim 1 wherein ~~separate or combined waste streams~~ are depleted ~~in sodium bicarbonate concentration as appropriate to crystallize sodium~~

carbonate decahydrate used as described in (the instant patent), or used to concentrate sodium carbonate in streams feeding other sodium carbonate salt processes.

9. A process according to claim 2 wherein (separate or combined waste streams) are depleted in sodium bicarbonate concentration as appropriate to crystallize the specific sodium carbonate salt species desired that includes dense sodium carbonate and sodium decahydrate used as described in (the instant patent), or used in the production of medium or light density sodium carbonate.
10. A process that extends the life cycle of surface evaporation ponds wherein (the purge stream in step b of Claim 1 is received by about one-half the concentration and flow of the combined purge streams from monohydrate and other known sodium salt evaporation/crystallization processes.)
11. A process that substantially reduces the hazards of accumulated waste stream disposals comprising treating the stream according to the process of Claim 1.

no process steps

2014-2015-0102